Diffraction in cenral eA collisions

EIC taskfroce meeting

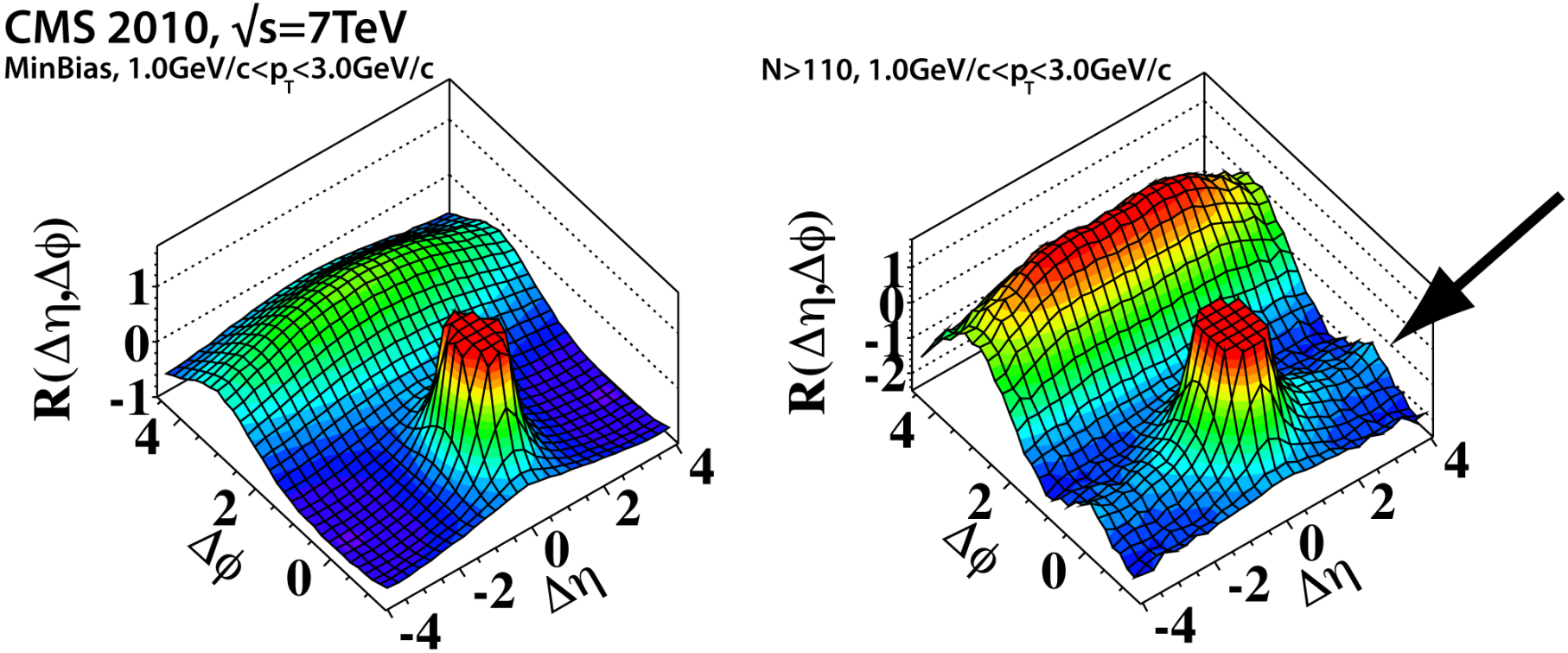
Heikki Mäntysaari

University of Jyväskylä
Department of Physics

Jan 16, 2014

Why to go central?

First "discovery" of the LHC: high-multiplicity pp collisions



Very rare events, $\sim 1/10^5$

Most central

Probe saturation phenomena.

- Large saturation scale Q_s^2
- Spectra (e.g. diffractive J/Ψ production) should deviate significantly from minimum bias events

Idea: incoherent diffraction, trigger events with large nucleon multiplicity at forward rapidities.

Nuclear breakup

Incoherent diffraction, the nucelus will break up. Two contributions:

- *Evaporation*: energy/momentum transfer excites the nucelus, then much later it evaporates. Nucleon spectrum should follow $\sim exp(-E/T)$+boost.
- *Ballistic*: Dipole transfers significant amount of longitudinal momentum to the nucleon and kicks it out. When traveling out from the nucelus the nucleon scatters off other nucelons and may also kick them out.

Consider events where the nucleon spectrum is significantly deviated due to the ballistic component $\Rightarrow$ "centrality".

Kinematics

Want largish $x_{\mathbb{P}}$ (large longitudinal mom. transfer), small x, not too large p_T. t such that incoherent diffraction is important.
There could be a kinematical window in the EIC kinematics, some example:

- Consider diffractive J/Ψ production, fix $Q^2 = 1\ \mathrm{GeV}$, $x_{\mathbb{P}} = 0.1$, $t = 0.1\ \mathrm{GeV}^2$
- Then $W^2 = 110\ \mathrm{GeV}^2$, $x \approx 0.01$, $\beta \approx 0.1$
- Long. momentum transfer $10\ \mathrm{GeV}$. Initial nucleon rapidity $y_1 = 5.3$, if this given to one nucleon $y_2 = 5.15$, if distributed to 10 nucleons, $y_2 = 5.25$ (here $P_z = 100\ \mathrm{GeV}$).
- J/Ψ $p_T \sim 0.15\ \mathrm{GeV}$, $y \sim 1.8$.